Woodard and Curran Comments (Representing McCain Foods)

Letter received from Paul Porada of W&C, Feb 12, 2004.

1. Comment: Both the introduction and Table 1 indicate that McCain Foods has a licensed flow average of 2.5 MGD. McCain has a two tier license and it may be beneficial to the readers to clarify this. Present facility production places the wastewater flows in the Tier #1 license, or 2.5 MGD. The Tier #2 license flow of 4.0 MGD would apply upon completion of an expansion in potato processing capacity. The expansion project by McCain has yet to occur.

Response: Agree. This will be clarified in table 1 and the Introduction section of the final report.

2. Comment: Page 7 of the report says that data collected on August 28-30 were used to calibrate the model, and data collected on August 14-16 are used to verify the model. Two points of refinement can be made. First, the data collection periods are 5-day events which commence with wastewater samples dates ahead of river water sample dates. For example the so called 'first data set' collection started August 12, and ended August 16. The second point of clarification is that the environmental parameter rates of Table 5 show the process resulted in two separate calibration sets and no verification set. As noted on page 12 a few parameter rates for the benthal BOD, phosphorous and algal loss are varied within each calibration model. It does appear that the predictive case 7Q10, and 30Q10 models splits the difference of these two calibration models. For a demonstration of the model's response to the user judgment applied in assigning rates, it would be informative to know how well the August 12-16 model would verify the model's prediction accuracy if the August 26-30 calibration environmental parameter rates were applied. Can this calibration\verification comparison be provided?

Response: The three day periods are when most of the data was collected and are hence being used to describe the data sets. Data three weeks previous to the second data set and two weeks previous to the first data set were actually used, when available, for the model input. These time periods represent the time of travel over the study reach. Both of these points will be clarified in the final report.

Your second point of contention for calibration Vs verification of the model greatly exaggerates the amount of variability in the assignment of parameter rate inputs for model calibration and verification. As stated in the draft report, different rates were only assigned in 4 of the 37 rates considered and in only some of the modeled reaches; or about 4% of the time when considering the number of rates and length of the river in which they were assigned. More importantly, can all of the rates be expected to be constant or easily defined in a environment that is so unstable? The answer to this is obviously no.

The point that needs to be addressed in the final report is how much of a difference would result in the prediction runs? The rates assigned for both input calibration and verification could be used to define a range of predictions and the average of these (as was done in the draft report) the expected prediction. This could be viewed as the limitations of the model, given the variability in the data and the amount of data collected to describe this variability. This approach is better than observing the range of the model calibration / verification output to observed data, since ultimately the modeler would have to accept marginal matches of the model to observed data in the prediction runs. Additional prediction runs with varied parameter rate inputs and text explaining it will be provided in the final report.

3. Comment: The PO4-P Uptake Rates are a negative flux, i.e. a loss rate within the model. It would be easier for the reader to understand this condition if the negative sign was placed in front of these PO4-P flux rates summarized on Table 5.

Response: Table 5 actually is defining an uptake rate of PO4-P, not a flux. A negative flux is more difficult for the reader to understand than just explaining it as uptake.

4. Comment: From statements on page 12 and discussion on page 30 the report deduces that large quantities of orthophosphorous (PO4-P) are being taken up by bottom attached plants. We disagree that the large loss of PO4-P is actually uptake by benthic algae. We believe it is a physical chemical process, not a biological removal process, and to support this theory we offer the following explanation.

Aroostook county water is relatively hard, having dissolved minerals, especially during summer when flows are low. The parent material for regional soils there is often limestone, and rock formations in the area contain calcium and magnesium, hence the hard water. The calcium in the water is precipitating the PO4-P as calcium phosphate (apatite). The reaction of dissolved calcium and phosphate occurs better if there are seed crystals such as sediment or rock present, certainly the case in a river. A higher pH solution, as apparently exists in the Aroostook River, would further enhance the reaction. Ferric and aluminum ions would have similar effect on removing PO4-P from solution. In support of this phosphorous precipitate phenomenon the Department should reference the letter from McCain Foods to Bill Sheehan of the DEP, dated September 17, 2002. In the letter a description of white particles found on the river bottom below the outfall are described. When tested, the white particles were found to be an inert solid containing phosphorous.

Response: This theory is a possible explanation for some of the losses of phosphorus in the Aroostook River and will be included in the final report as something to investigate in future data collection. Even if it does occur, the high levels of algae are indirectly causing this phenomena by causing a much higher pH in the river than what would ordinarily occur in a mesotrophic or oligotrophic system. DEP has observed the rapid uptake of large amounts of orthophosphorus in other river studies with high levels of bottom attached algae, and this is probably the major cause of phosphorus uptake.

5. Comment: The CBOD source rates were assigned by user judgment, yet no literature rates are given in Table 4. Are these CBOD source rates simply guesses that make the BOD calibrations fit? Does literature support that CBOD source rates are higher below point sources?

Response: The BOD decays rates for the Aroostook are well defined through many laboratory tests taken at many river locations in both data sets. It is therefore reliable to use curve fitting as a method of describing CBOD source rates, so long as their assignment makes logical sense, i.e. higher rates are assigned in reaches where there are pollutant inputs. There is little literature guidance for the assignment of these rates, other than it is variable and it makes logical sense that it would be higher below a point source or other significant pollutant input.

6. Comment: Table 4, page 13, indicates that the oxygen production rates for both algae and periphyton are far above literature ranges for these rates. These unusual rates were necessary to make the model fit the data. However, it is likely these unusually high rates are an indication that there is another factor of the dissolved oxygen balance that is not properly accounted for and that algal representation is awry.

Response: The unstable nature of dissolved oxygen makes this parameter difficult to define. A great deal of time was spent attempting to define this parameter and this is the best that could be done with the given data. Given that dissolved oxygen compliance is not an issue in either the data or model prediction runs, it is not worthwhile spending a lot more time on this issue. DEP is always willing to consider making adjustments to any model provided pro-active and constructive comments are made that are not ambiguous. These comments could be useful for improving the performance of the model. However if criticism of the model takes the place of helpful suggestions, no further improvements can be made to the model.

7. Comment: The model simulates McCain Foods effluent having dissolved oxygen of 2.0mg/L. In fact, effluent DO levels for McCain Foods are always much higher, typically greater than 8 mg/L. This particular effluent DO value may not be critical to river oxygen, but it would be appropriate for the model representation to be as accurate as possible.

Response: McCain Foods' dissolved oxygen effluent levels will be inputted as 8.0 ppm in the prediction runs for the final report.

8. Comment: Table 5 indicates that the PO4-P uptake rate in model Reach 10 is -0.01 mg/ft^2-day. We have observed that the 7Q10 model input utilizes -0.05 mg/ft^2-day for this reach. Is there a reason?

Response: This is an apparent input error that will be corrected in the model prediction runs for the final report.

9. Comment: The phosphorous loading for McCain Foods input into the 7Q10 predictive case model file is not correct. The flow value in Table 9 did not match the numeric model data set. It appears that the concentrations were calculated using the Tier #1 license flow of 2.5 MGD, and then the flow rate for the Tier #2 license value of 4.0 MGD was used in the numeric input. The error results in 60% more total phosphorous being simulated in the 7Q10 model than is allowed by the license.

Response: Agree. This will be corrected in the final report.

10. Comment: In the absence of dissolved oxygen non-attainment on the Aroostook River it appears that the Department had to find another reason to justify phosphorous reduction. Text of page 45 and 48 is implying that recreational use of the Aroostook River is not being met. Historically, bacteria, pathogens, and toxics have been considered the factors precluding water contact recreation. We are unaware that the Department has changed use interpretation such that algae can cause water to be unsuitable for swimming or recreation. The standard and its source should be referenced in the report.

Response: This interpretation has already been used in other TMDL's approved by EPA and is explained fully in the second paragraph of the section "Model Predictions with Reduced Point Source Phosphorus" (P 48). Woodard and Curran should be aware that water quality standards contain both narrative and numerical standards and both are equally important in defining the attainment / non-attainment status of water bodies.

11. Comment: The second paragraph of page 48 provides the basis for using an 8 ug/L chlorophyll-a level which in turn is used to derive nutrient loading limits for wastewater discharges. We do not agree with the approach of applying lake thresholds to riverine systems because there are significant differences in algal species and flushing dynamics present in the different water systems. In support of the 8 ug/L chl-a level as a threshold to prevent nuisance algal blooms the modeling report makes reference to the EPA's Nutrient Technical Guidance Manual for River and Streams [presumably EPA-882-B-00-002]. This threshold level is being presented in the modeling report out of context because the EPA document says the "8 ug/L chl-a level constitutes the dividing line between eutrophic and mesotrophic lakes."[EPA, page 102]. We also observe that EPA's document states "algal species composition should be used in the data analysis to validate stream classifications and enable development of indicators of nutrient conditions and the likelihood of nuisance algal blooms." [EPA, page 81]. The modeling report accurately states that it is uncertain what chlorophyll-a levels should be used to describe blooms in flowing waters. Until such time as the state develops science-based chlorophyll-a criterion for rivers, we believe it is inappropriate to be making licensing decisions based upon this acknowledged uncertainty.

Response: It is not only the levels of chlorophyll-a in the water column, but also the levels of bottom attached algae, which could ultimately define phosphorus limits for point source discharges. As stated in the draft report, the nutrient criteria to be developed next year will be the deciding factor on where limits may fall. It was not the intention in the report to immediately require P-limits. This will be clarified in the final report. The P-limits should proceed only after the collection of an additional data set under reduced phosphorus inputs and the establishment of the nutrient criteria.

DEP thought it was important to make all stakeholders aware of the nutrient issue on the Aroostook River and give some idea for ballpark estimates of phosphorus allocations, given the current science and knowledge of this issue. A level of 8 ug/l is listed in the EPA River Nutrient Criteria Technical Guidance Manual as a threshold level for eutrophy (p101) which is analogous to a bloom threshold. Given that algae blooms in rivers will almost always develop in impoundments with little current, there is little difference to the lake environment and there should also be little difference in describing a bloom threshold. A range of 8 to 12 ug/l for chlorophyll-a is being used as the likely threshold level for algae blooms in the final report.

Given the high levels of benthic and floating algae, and the large swings in DO and pH on the Aroostook, it is obvious that nutrients are an issue here and some reductions of phosphorus are likely in the near future. It is hoped that McCain's and other stakeholders take this issue seriously and at least consider what the targeted P-reductions investigated in the report will mean for them. It is also hoped that some of the stakeholders will agree to voluntary P-reductions in a future summer under which more data can be collected. Such a program of voluntary P-reduction and river data collection has occurred at the Houlton discharge and Meduxnekeag River for a number of years with great success.

12. Comment: On page 51, Table 12 summarizes pH readings. Conclusions are being made that the high afternoon pH is the result of algae, hence indirectly related to phosphorous discharges. The data set used in reaching the conclusion is only from daylight hours. To be validated this conclusion needs to be supported by night pH values. If pH is high both day and night it is likely caused by water chemistry rather than diurnal algal effects.

Response: AM pH data could be collected in the future, but it should be obvious to most readers with a science background that pH values of 8 to 9 are not a normally occurring phenomena without some unusual situation such as a highly eutrophic system. The high algae levels and large diurnal DO swings both suggest that the algae are the cause. DO and pH diurnal swings on these systems almost always occur together.

13. Comment: Other measures to protect the river are available, such as lowering flash boards on dams to cut detention time, or even full dam removal. Can these and similar options be evaluated as part of the solution?

Response: These measure could reduce the growth of phytoplankton, but would increase the growth of benthic algae. An interesting question could be are the impoundments actually helping dissolved oxygen in a environment of lush nutrients by inhibiting or interrupting the growths of continuous benthic plants?

14. Comment: Agriculture and other non-point source contribution, albeit a smaller effect during drought events, does contribute to the overall long term water quality. The report indicates the need for Best Management Practices for non-point source control and prioritizes watersheds, yet falls short of assigning responsibilities. Who might be the appropriate parties to assist with non-point source abatement?

Response: This is beyond the scope of the report, which investigates model inputs and expected water quality.

McCain Foods

Email message received from Bill Daniels Jan 12, 2004. Employee of McCain Foods.

Hello Paul,

In reviewing the Aroostook River Modeling Report Draft, I noticed on table 1, that you had used Tier II figures for McCain Foods BOD5 effluent limitations with Tier 1 flows of 2.5 mgd. Tier II flows are 4.0 mgd.

Would it be possible to insert the words "Permitted Limitations of Point Source Discharges to Aroostook River" ? As it stands, it is shedding poor light on the facilities listed leading the reader to think that those are actual discharge figures. Your clarification on the collective dischargers would be of better service listed under this table.

Thank You

Bill Daniels, Environmental Coordinator

McCain Foods USA, Inc, Easton

Response: The tier I and tier II production levels will be clarified in table 1 and the introduction section of the final report. It will also be clarified that the numbers in table 1 are license limitations, not actual discharge levels.

Steve Sutter

Abutting landowner to McCain Foods. Email message received Jan 27, 2004.

Paul

Appreciate your good work.

Minor edits (1) Figure 16 has an incomplete Note at the top, (2) page 48 last paragraph "Presque Isle is currently" and (3) a period to conclude the text (page 51).

Stakeholder comments from Steve Sutter, abutter to McCain Foods

1. Executive summary #10 non point BMP "should be implemented on all tributaries that meet with the main stem at and below Presque Isle." I reported to MDEP nuisance algae at the confluence of Merritt Brook with the river September 2003, for example. (Or at least advise the reader how MDEP selects priority tributaries.

2. In introduction, I suggest you at least footnote that there was still a (perhaps in your judgement relatively minor) point source (overboard discharge) between McCain Foods and Caribou in 2001 and 2002. It's Phoenix Enterprises, dba Town and Country Apartments (licensed 8500 gpd, BOD5 30 mg/l). It could be contributing to eutrophication at Maysville.

3. Page 41 Figure 14 shows chlorophyll-a topping 8 ug/l from a point below McCains to the international border. Suggest that you substitute that for the word “Maysville.”

Thank you for your consideration.

Steve Sutter

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Response: The minor edits are noted and will be corrected in the final report.

1. The ranking system was developed as follows. By observing the difference in dry weather and wet weather total phosphorus concentrations and the actual TP levels in all tributaries relative to one another, a ranking system was developed (high medium, low) for each tributary. A high ranking was assigned to tributaries with at least one TP concentration approaching 50 ppb and a noticeable elevated level in most of the wet weather TP samples when compared to the dry weather TP samples. A medium ranking was assigned when a majority of all TP samples were greater than 20 ppb; at least one TP concentration approaching 40 ppb; and a noticeable elevated level in most of the wet weather TP samples when compared to the dry weather TP samples. A low ranking was assigned when most of the TP concentrations of all samples was under 20 ppb and there was no noticeable difference in TP concentrations when comparing the wet and dry weather TP concentrations. This explanation will be added to the test in the final report. Merritt Brook was assigned a high ranking priority for non-point source BMP’s.

2. The footnote will be added in the introduction section of the report. This discharge is relatively minor compared to the others in the report, since it is diluted 986:1 at 7-day 10-year low flow conditions.

3. Figure 14 has major towns in the watershed inserted as text as a convenience to the reader who may not be familiar with the river mile locations.